



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/583,120	05/30/00	BAGRODIA	S 05015.0302

IM22/1029
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EXAMINER
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ART UNIT 1714	PAPER NUMBER
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DATE MAILED: 10/29/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/583,120

Applicant(s)

BAGRODIA ET AL.

Examiner

Katarzyna W. Lee

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#7

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 19-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) 1-18 and 22-30 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) 1-30 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3-6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-18 and 22-30, drawn to nanocomposite, method of making a nanocomposite and an article, classified in class 524, subclass 445.
 - II. Claims 19-22, drawn to an article having a structural limitations, classified in class 428, subclass 34.6.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)). In the instant case the nanocomposite does not have to have specific number of layers in the composition. It may be utilized as membrane or single film.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

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4. Because these inventions are distinct for the reasons given above and the search required for Group II is not required for Group I, restriction for examination purposes as indicated is proper.

5. During a telephone conversation with Mr. Murphy on October 17, 2001 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-18 and 22-30. Affirmation of this election must be made by applicant in replying to this Office action. Claims 19-22 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

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2. Claims 2-4, 7, 8, 13, 20, 21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 2-4, 7, 8, 13, 20, 21 are rendered as indefinite claims since it contains an improper Markush language. According to MPEP 2173.05(h) the Markush language may recite for example: "...wherein R is selected from the group consisting of A, B, C and D" or "...wherein R is A, B, C or D".

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) The invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. Claims 1, 2, 5-8, 10-12, 14-17 are rejected under 35 U.S.C. 102(a) as being anticipated by Pinnavaia (US 6,017,632).

Example E3 of the prior art of Pinnavaia discloses 3 ways smectite clay undergoes cation exchange. The third example (lines 45-52) specifically states, that the clay of the example 3E is pure. The examiner sees the recitation of "pure" as describing montmorillonite, which inherently meets applicant's limitation of $\leq 2\%$ quartz.

Following examples disclose methods for making nanocomposite, wherein the matrix polymer is epoxy (example e4-e6). Claim 16 further lists polymers such as polyurethane, polyurea, alkyd resin, polysiloxane, polyester and polyimide.

Clay, according to claim 15 of the prior art of Pinnavaia is smectite type clay and the examples disclose use of montmorillonite clay, hectorite clay, fluorohectorite, vermiculite and rectorite (Table 4, col. 23). Clay in the examples of the prior art of Pinnavaia is utilized in the amount of 10% by weight (E2, E4), 5% by weight (E5).

Cationic ammonium compounds as shown in the examples were utilized to pretreat the clay before forming nanocomposite. The examples give specific recitation of $C_{18}H_{37}NH_3$ alkyl ammonium compound (E5) or NH_4^+ (E3).

The layered silicate of the prior art of Pinnavaia are exfoliated, which means that the clay is in single platelet form and tactoids when the silicates are also disclosed to be only intercalated or still in form of an aggregate.

With respect to the properties such as haze and permeability, these will be inherent properties of the thermoplastic composition of the prior art since applicant teaches these properties as resulting from the use of pure clay. In addition, the composition of the prior art of Pinnavaia is utilized to make articles, which are molded reinforced composites.

In the light of the above disclosure, the prior art of Pinnavaia anticipates claims rejected above.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1, 2, 5-8, 10-12, 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinnavaia (US 6,017,632) in view of Clarey (US 6,050,509).

This rejection is being made in the event, that the applicant can demonstrate that the “pure” clays in the prior art of Pinnavaia does not meet the numerical limitation of $\leq 2\%$.

The discussion of the disclosure of the prior art of Pinnavaia from paragraph 4 of this office action is incorporated here by reference.

The difference between the present invention and the disclosure of the prior art of Pinnavaia is a numerical recitation of the purity of the clay component.

With respect to the above disclosure the prior art of Clarey discloses process for purifying clay for use in nanocomposites.

According to the preferred embodiment of the prior art of Clarey, the amount of the impurities after treatment is less than 1% by weight (col. 1). The impurities include quartz, feldspar, gypsum, albite and the like (col. 3).

Impurities in a natural clay result in discoloration and haze and it may impair properties such as gas permeability of the composition (col. 1, lines 40-47).

In the light of the above disclosure, it would have been obvious to one having ordinary skill in the art to purify clay component, so that the product obtained would have clear, transparent appearance and good gas permeability.

9. Claims 3, 4, 13, 18, 22-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinnavaia (US 6,017,632) in view of Clarey (US 6,050,509) as applied to claims 1, 2, 5-8, 10-12, 14-17 above, and further in view Beal (US 5,552,469)

The discussion of the disclosure of the prior art of Pinnavaia from paragraph 4 and Clarey from paragraph 8 of this office action is incorporated here by reference.

The difference between the present invention and the disclosure of the prior art of Pinnavaia and Clarey is recitation of the process of making nanocomposite and recitation of different polymers, which can be utilized and articles.

With respect to the above difference, the prior art of Beal discloses a process for making nanocomposite. The intercalates of the prior art of Beal are formed by contacting phyllosilicate with an oligomer or polymer to sorb or intercalate the intercalant and as a result, expand the spacing between the layers (col. 4, lines 32-39). Next intercalates are exfoliated and dispersed into one or more melt processible thermoplastic or thermosetting matrix polymers (col. 13, lines 35-40). The choice of the thermoplastic polymer will vary with intended use and they have to be melt processible. The list of the polymers disclosed in the prior art of Beal specifically includes polyamides such as poly(m-xylylene adipamide, polyhexamethylene adipamide and the like (col. 4, lines 9-15).

The equipment utilized to melt process the nanocomposite of the prior art of Beall includes various types of mixers, as well as extruders and injection molding machines (col. 18, lines 43-45). The articles include films panels as well as sheets containing other layers that nanocomposite layer (col. 19, lines 24-27).

Although the prior art of Beal does not disclose use of organomodified clays, it teaches that using oligomers instead of polymer as intercalants is advantageous, since the oligomers as smaller molecule can more efficiently intercalate in between the layers of the phyllosilicate and still result in exfoliated platelets (col. 3).

In the light of the above disclosure, it would have been obvious to one having ordinary skill in the art at the time of the instant invention to utilize oligomers as intercalants for modified clays and still obtain the claimed invention. Oligomers are more easily sorbed between the silicate platelets and will also result in a nanocomposite having individual platelets.

10. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pinnavaia (US 6,017,632) in view of Clarey (US 6,050,509) and Beal (US 5,552,469) as applied to claims 1-8, 10-18, 22-30 above, and further in view of Maxfield (WO 94/11430).

The discussion of the disclosure of the prior art of Pinnavaia, Clarey and Beal from this office action is incorporated here by reference.

The difference between the present invention and the disclosure of the prior art of Pinnavaia, Clarey and Beal is the disclosure of the dimensions of the layered silicate.

With respect to the above difference, the prior art of Maxfield discloses a polyamide nanocomposite comprising layered silicate. The silicate has average thickness of 15 angstroms (equivalent to 1.5 nm) and diameter of the platelet of 200-2000 angstroms, which is equivalent to 20-200 nm (page 8).

The prior art of Maxfield discloses that the nanocomposite taught can be utilized in making films and laminates for use in food packaging or bottles. This signifies, that the nanocomposite also has to have excellent gas barrier properties.

In the light of the above disclosure, it would have been obvious to one having ordinary skill in the art at the time of the instant invention to utilize silicates having particle dimensions of Maxfield in the disclosure of the prior art of Pinnavaia, Clarey and Beal and still obtain the

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claimed invention. Use of the silicates of Maxfield will also result is a composition having excellent gas barrier properties.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katarzyna W. Lee whose telephone number is (703) 306-5875. The examiner can normally be reached on Mon-Thurs 6:30 AM-4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on (703) 306-2777. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3599 for regular communications and (703) 305-3599 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

KIWL
October 23, 2001

EDWARD J. CAIN
PRIMARY EXAMINER
GROUP 1500

